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$$\beta^4+38\beta^2\gamma^2-16\beta\gamma^3+233\gamma^4=\square\ldots.(11).$$

By putting the left member of $(11)=(\beta^2+19\gamma^2)^2$, and solving, we find $\beta=-8\gamma$. To make β positive, let $\beta=\delta-8\gamma$; then substituting in (11), reducing, and putting the left member$=(\delta^2-16\gamma\delta-83\gamma^2)^2$, we find $\delta=1332\gamma/83$, which is an integer when $\gamma=83$. Then $\delta=1332$, $\beta=668$, $a=291330$, $b=439335$, $c=207334$, and $x=937999$. Hence the required numbers are

$$ax=273267248670.$$

$$bx=412095790665.$$

$$cx=194479084666.$$

PROBLEMS FOR SOLUTION.

ARITHMETIC.

160. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College. Defiance, Ohio.

A farm is rented for \$$R$,=\$300, in cash and a certain number of bushels of wheat. When wheat is \$$n$,=\$4-5, per bushel the rent is p%,=12½%, lower than when wheat is \$$m$,=\$1 1-5, per bushel. Find the number of bushels of wheat.

161. Proposed by F. M. SHIELDS, Coopwood, Miss.

If 1 man, 1 boy and 1 girl catch 1 trout, 1 perch and 1 minnow in 5 minutes, and 1 man, 2 boys and 3 girls catch 1 trout, 2 perch and 3 minnows in 6 minutes, how many minutes will be required for 2 men, 3 boys and 4 girls to catch 5 trout, 11 perch and 17 minnows?

ALGEBRA.

162. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy, Defiance College, Defiance, Ohio.

By Sylvester's dialytic method form the eliminant between $mx^3+py^2=0$ ....(1), and $px^2+my^3=0$....(2). Also between $mx^4+py=0$....(1), and $px^3+my^3=0$....(2).

163. Proposed by J. K. ELLWOOD, A. M., Principal of Colfax School, Pittsburg. Pa.

Solve $x^4-x=14$, by quadratics.

GEOMETRY.

189. Proposed by J. C. CORBIN, Pine Bluff, Ark.

The perpendicular from the right angle on the hypotenuse of a right-angled-triangle is a harmonic mean between the segments of the hypotenuse made by the point of contact of the inscribed circle. [From Casey's Sequel to Euclid.]